A case study of long-distance dependencies in Korean with *wh*-scope

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[Introduction] This study investigates the processing of long-distance dependencies in Korean, a head-final language, with a focus on *wh*-scope. Psycholinguistic theories on the processing of long-distance dependencies between a filler and a gap vary with respect to the relevant factors deriving Active Filler effects (Frazier & Clifton 1989), such as i) minimal chains (De Vincenzi 1991), ii) verb/theta-role driven principle (Gibson, 1991; Pritchett 1992), and iii) full constraint driven principle (Aoshima et al. 2004). Since the computation of *wh*-scope in Korean involves many factors including surface positions of *wh*-phrases (in-situ *vs.* scrambled) and types of C^0 (declarative *vs.* question), Korean provides a useful testing ground for Active Filler effects. This study aims to reveal which principle most accurately explains the processing of long-distance dependencies in Korean as well as which factor (theta role or C type) is significantly involved.

[Methodology] To monitor on-line processing of Korean *wh*-scope, I conducted a self-paced reading experiment using IBEX. To determine where the initial interpretation of a fronted dative *wh*-phrase in Korean happens (main clause *vs*. deepest embedded clause), and which factor is responsible for Active Filler effects, we controlled three factors in our stimuli: verb type (transitive *vs.* ditransitive), C (declarative *vs.* question), and *wh*-phrase position (in-situ *vs.* scrambled), shown in Table 1. Eight sets of stimuli were created. *Wh*-phrases used in the experiment were dative arguments. A total of 64 (=8 sets x 8 conditions) target sentences with 102 fillers were presented in a random order. Each sentence was followed by a comprehension test. 18 native Korean speakers participated in the experiment.

[Prediction] Based on the minimal chain approach, if the parsing of *wh*-phrases is driven by the need to create a gap as soon as possible, a gap will be created in the matrix clause, and there is no reason for the parser to revise their analysis when encountering the embedded clause. According to the verb/theta-role driven approach, since the parsing of *wh*-phrases is driven by theta-role assignment, the gap will be created after the ditransitive verb is encountered because a dative *wh*-phrase is used. In contrast, the full constraint driven approach predicts that a gap is first posited in the main clause, and then re-positioned in the embedded clause after the embedded subject is encountered, allowing the fronted *wh*-phrase to receive a thematic interpretation as early as possible. However, if the embedded verb cannot assign a proper theta-role to it, reanalysis will happen. In addition, the association of a fronted *wh*-phrase and a question C to compute its semantic scope could not take place once the embedded C is processed, reanalysis will happen after the embedded C.

[Results & Discussion] The results are summarized in figure1-4. A linear regression model was fitted for statistical analysis. First, the comparison of S1 *vs.* S2 in figure 1 shows that there is no significant difference in reading time ($p > 0.1$) after region 5($V_{Embedded}$+C). This provides evidence that Korean speakers prefer to create the gap as soon as possible and reanalysis does not happen unless necessary. This also suggests that the dependency between a *wh*-phrase and an interrogative C was not enough to trigger reanalysis. In figure 2, the slower reading time in region 6 (adverb) was found after the transitive embedded verb (S3) than the ditransitive verb (S1) ($p < 0.1$). This result shows that the thematic role requirement of the fronted phrase affects the processing of filler-gap dependencies. Once the verb which can properly assign a theta role to the fronted *wh*-phrase is encountered, the parser seems to revise the original analysis. The comparison of S1 *vs.* S4 shows the interaction effect of thematic role assignment and association with an interrogative C. When the embedded verb can assign a theta role to the *wh*-phrase and the following C can license its scope, reanalysis happens and *wh*-scope is calculated there. Thus, the longer reading time in region 5 is observed in S4 than in S1 but the reading time after region 5 is shorter in S4 than in S1 ($p < 0.1$). In *wh*-in-situ conditions in figure 4, the longer reading time after the embedded C can be explained with the cost of unfinished *wh*-scope licensing. In conclusion, the results of this study support the full constraint driven principle that the processing of filler-gap dependencies is conditioned by the need to satisfy grammatical requirements (theta-role assignment and *wh*-scope licensing) as well as to create a gap as soon as possible.

Table 1. Stimuli (M: Matrix, E: Embedded)

	Region1	Region2	Region3	Region4	Region5	Region6	Region7
S1	wh	subject(M)	subject(E)	object(E)	transitive verb(E)-Dec	adverb	ditransitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssess-tako*	*ecey*	*malhaycwuess-nayo*
	'To whom did Ciyu say that Sena wrote a card yesterday?'						
S2	wh	subject(M)	subject(E)	object(E)	transitive verb(E)-Q	adverb	ditransitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssess-nunci*	*ecey*	*mwulepoass-nayo*
	'To whom did Ciyu ask whether Sena wrote a card yesterday?'						
S3	wh	subject(M)	subject(E)	object(E)	ditransitive verb(E)-Dec	adverb	transitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssecwess-tako*	*ecey*	*alko_issess-nayo*
	'Did Ciyu know to whom Sena wrote a card yesterday?'						
S4	wh	subject(M)	subject(E)	object(E)	ditransitive verb(E) -Q	adverb	transitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssecwess-nunci*	*ecey*	*kwungkumhayhayss-nayo*
	'Did Ciyu wonder to whom Sena wrote a card yesterday?'						
S5	wh	subject(M)	subject(E)	object(E)	ditransitive verb(E) -Dec	adverb	ditransitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssecwess-tako*	*ecey*	*malhaycwuess-nayo*
	'To whom did Ciyu say (to you) that Sena wrote a card yesterday?'						
S6	wh	subject(M)	subject(E)	object(E)	ditransitive verb(E) -Q	adverb	ditransitive verb(M) -Q
	Nwukwueykey	*Ciyu-nun*	*Sena-ka*	*khatu-lul*	*ssecwess-nunci*	*ecey*	*mwulepoass-nayo*
	'Did Ciyu ask to whom Sena wrote a card yesterday?/ To whom did Ciyu ask (to you) that Sena wrote a card yesterday?'						
S7	subject(M)	subject(E)	wh	object(E)	ditransitive Verb(E) -Dec	adverb	ditransitive verb(M) -Q
	Ciyu-nun	*Sena-ka*	*nwukwueykey*	*khatu-lul*	*ssecwess-tako*	*ecey*	*malhaycwuess-nayo*
	'Did Ciyu say to whom Sena wrote a card yesterday?' To whom did Ciyu say (to you) that Sena wrote a card yesterday?'						
S8	Subject(M)	Subject(E)	wh	object(E)	ditransitive Verb(E) -Q	adverb	ditransitive verb(M) -Q
	Ciyu-nun	*Sena-ka*	*nwukwueykey*	*khatu-lul*	*ssecwess-nunci*	*ecey*	*mwulepoass-nayo*
	'Did Ciyu ask to whom Sena wrote a card yesterday?' To whom did Ciyu say (to you) that Sena wrote a card yesterday?'						

Figure 1. *C (wh-scope licensing) effect*

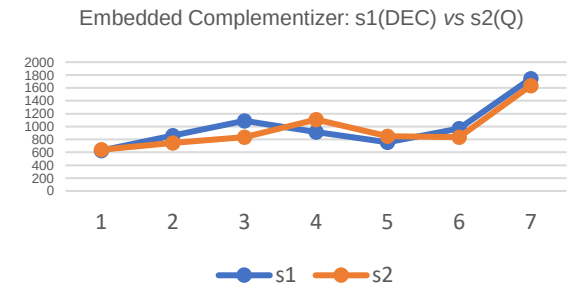


Figure 2. *theta-role effect*

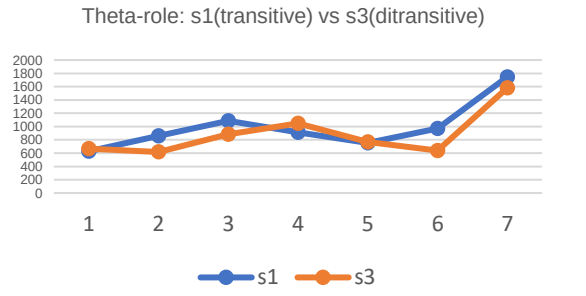


Figure 3. *Interaction of theta-role and a C*

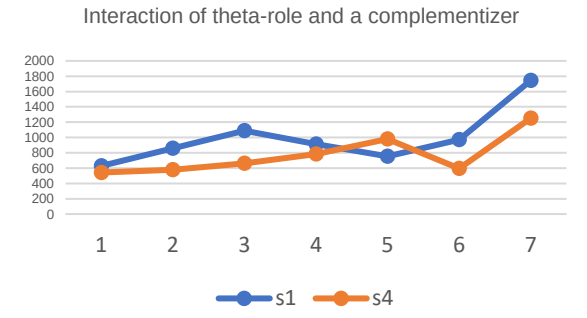
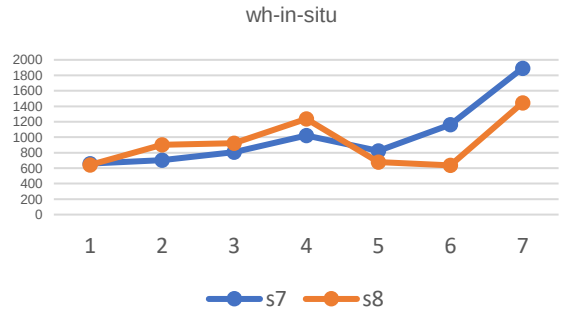


Figure 4. *wh-in situ*



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